CANADA

DEPARTMENT OF TRADE AND COMMERCE

STANDARDS BRANCH

3-EA.605
(Amended)

OTTAWA, January 8th, 1964.

TYPE APPROVAL

LANDIS & GYR TYPE "MAD2/FFD4.12" TORQUE BALANCE

TELEMETER TRANSMITTER

The apparatus specified and illustrated herein has been duly approved by the Standards Branch under the provisions of the Electricity Inspection Act, Chapter 94, R.S. 1952, and may be admitted to verification in Canada.

Apparatus Approved: Type "MAD2/FFD4.12" Torque Balance Telemeter Transmitter, manufactured by Landis & Gyr, Zug, Switzerland, and distributed in Canada by Landis & Gyr Inc., 725 Decarie Blvd., Montreal 9, P. Q.

Rating of Apparatus:

Millivolt Input	100 millivolts DC.
Source	Thermal Converter, 5 seconds minimum response period.
Maximum Input Resistance	100 ohms total including resistance of thermal converter.
Output Current	-5..0..+5 milliamperes.
Maximum Output Resistance	5000 ohms total resistance of loop including internal resistance of torque balance converter.
Supply Voltage	115 volts 60 cycles.

Description: This torque converter uses a self-balancing compensator circuit, the principle of which is to compare the input millivolts with an auxiliary internally-generated voltage appearing across a fixed resistance due to the output current. The combined input and output coils form a moving-coil system responding to the difference between the two voltages being compared, and regulating the output current until the opposing voltage drop is equal to the measured voltage.

This output current is the rectified output from the secondary of a transformer mounted on the front panel. The primary of the transformer forms part of a transistorized high frequency oscillator. A vane attached to the moving coil system extends through the front panel and causes variable shielding of the secondary of the transformer so that the output current is variable depending upon the position of the vane.

No adjustments are provided on the coil, transformer or vane and there are no springs on the moving system. Current to the moving coil is fed through two fine ligaments which normally produce no torque.

The only two adjustments are shown labelled as R19 and R21 in the photograph, and these adjustments act only on the output current.

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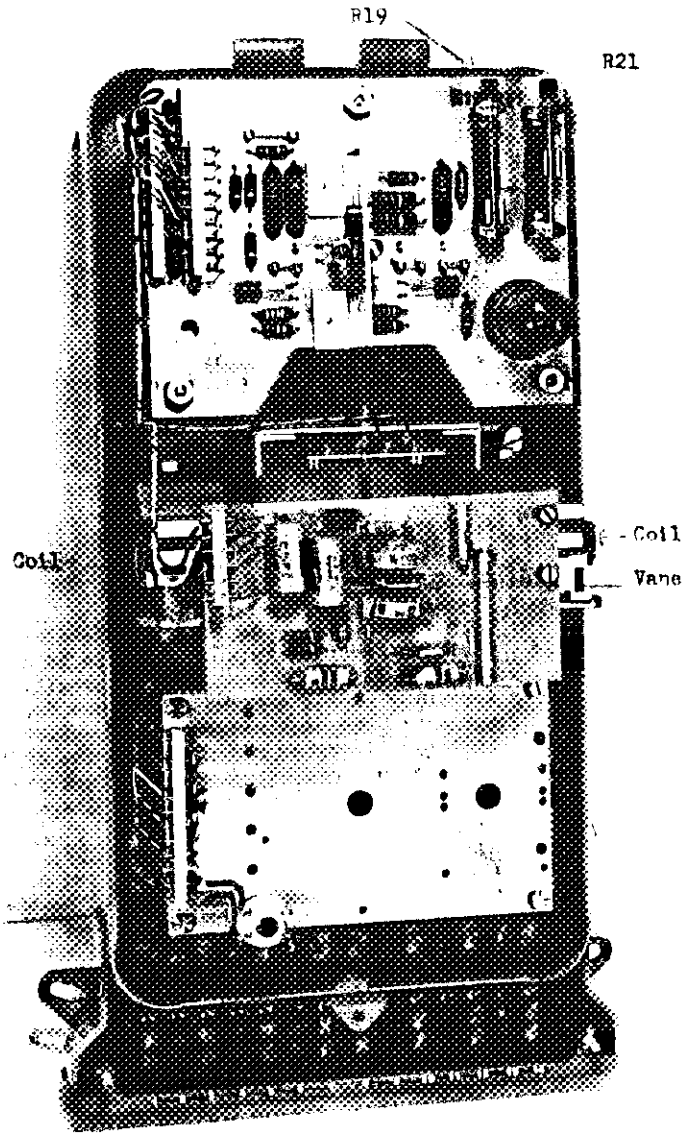

Description:(cont'd)

Adjustment R19 is a rheostat of 4000 ohms that is in series with the output circuit. Its function is to provide a degree of damping when the input millivolts are changing in value very rapidly.

As this approval covers the use of this torque balance converter when supplied with the millivolt output of a thermal converter with a response period not less than 5 seconds, the damping effect of rheostat R19 is not required. Moreover the maximum permissible resistance in the output transmission line is 5000 ohms which includes R19, so it will be necessary when verifying to make sure that R19 is shorted out.

It should be noted that transmission line resistance has no appreciable effect on the output current providing it does not exceed the specified 5000 ohm maximum.

The other adjustment R21 is a balance adjustment and affects the symmetry of the output milliamperes so that maximum excursion of the moving system produces approximately equal positive and negative values of output milliamperes.

Neither R19 nor R21 have any appreciable affect on the zero, i.e., zero milliamperes output with zero millivolts input.

The adjustment of R21 can be checked by gently rotating the moving coil to its extremes of travel against the stop in both directions, and with an open circuit on the input and 5000 ohms in the output circuit, the output current should be approximately the same in the positive and negative directions and should be 5 milliamperes or more.

The use of the 5000 ohm resistor in the above test is important as it indicates the ability of the torque converter to generate the required current.

The torque converter is intended for use in telemetering service where interference picked up by the transmission line is of such magnitude as to interfere with the millivolts normally used for this service.

The output of the torque converter being in milliamperes and the same in all parts of the circuit is less affected by interference affecting the transmission line.

However, as the only potentiometer type recorders as yet approved require a millivolt input, it is necessary to convert the output milliamperes from the torque converter to millivolts that can be recorded. This is done by passing the current through a fixed resistor and applying the voltage drop across it to the recorder.

Description: (cont'd)

The value of the resistor should be such that the required millivolts are produced, e.g., 5 milliamperes through 2 ohms produces .005 x 2 or 10 millivolts and the resistor should be a precision type. The use of resistors with a tolerance of ± 1%, ± 5% or more is not permitted.

It is permissible to use a number of torque balance converters for totalizing purposes, and place the voltage dropping resistors in series, with the torque converter output across its individual resistor, but it is necessary that the kilowatts or other power function per millivolt from each converter should have the same value and be of the correct polarity. It should also be kept in mind that the input and output of the torque balance converter are electrically connected.

Because of the sensitivity of the torque balance converter to mechanical vibration, it should be verified and used where this type of interference is a minimum and the potentiometer recorder used to record the output should have a pen speed of 5 seconds or longer to reduce unnecessary pen movement.

The torque balance converter is also sensitive to changes in level, particularly from side to side. Because of this, the instrument should be levelled before verification or use, using a bubble level on the top or side of the cover.

The instrument is also sensitive to changes in the resistance of the input circuit, and should be mounted close to the thermal converter with which it will be used, so that the total resistance including that of the thermal converter will not exceed 100 ohms.

The torque balance converter may be verified separately if necessary, using a portable potentiometer as a source of millivolts.

Special instructions for verifying these instruments will be issued on request to the district where they are presented.

E. F. Power

E. F. Power,
Chief, Electricity and Gas Division,
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Director,
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Ref: A10